

Listing of Claims:

1. (Currently amended) A differential diameter hole drilling method by which a through-hole having improved wall surface uniformity and a predetermined diameter is formed in a target material including opposed first and second major surfaces and having a thickness, comprising:

generating a first laser output having sufficient energy density over a first spatial spot size to remove target material within a first spot area;

directing the first laser output to impinge the target material ~~at a first starting point located within the first spot area and moving the first laser output along a path whose distance from the first starting point constantly changes, on the first major surface and~~ thereby forming form a pilot hole having a pilot hole diameter that corresponds to the diameter of the first spot area and that is less than the predetermined diameter of the through-hole;

generating a second laser output having sufficient energy density over a second spatial spot size to remove target material within a second spot area; and

directing the second laser output to impinge the target material ~~at a second starting point located within the second spot area and moving the second laser output along a path whose distance from the first starting point constantly changes, on the second major surface and~~ thereby forming form a through-hole that extends through the thickness of the target material and that has a through-hole diameter corresponding to the diameter of the second spot area and to the predetermined diameter, the formation of the through-hole involving the addition of thermal energy that escapes through the pilot hole and thereby limits thermal distortion of the through-hole wall and enhances its surface uniformity.

2. (Canceled)

3. (Currently amended) The differential diameter hole drilling method of claim 1, in which the generating and directing the second laser output to impinge the target material includes forming a portion of the through-hole before forming the pilot hole, the portion of the through-hole having the predetermined diameter and extending only partly through the thickness of the target material, and in which the pilot hole extends partly through the thickness of the target material.

4. (Original) The differential diameter hole drilling method of claim 1, in which the pilot hole and the through-hole have, respectively, a pilot hole axis and a through-hole axis, and in which the directing the second laser output to impinge the target material includes spatially aligning the through-hole and pilot hole axes.

5. (Original) The differential diameter hole drilling method of claim 1, in which the pilot hole extends only partly through the thickness of the target material.

6. (Original) The differential diameter hole drilling method of claim 1, in which the pilot hole extends through the thickness of the target material.

7. (Original) The differential diameter hole drilling method of claim 1, in which the through-hole has a diameter of less than 150 microns.

8. (Original) The differential diameter hole drilling method of claim 1, in which the target material comprises a non-homogeneous material.

9. (Original) The differential diameter hole drilling method of claim 8, in which the target material comprises a multi-layered electronic circuit board.

10. (Original) The differential diameter hole drilling method of claim 9, in which the multi-layered electronic circuit board comprises a multi-layered fiberglass reinforced printed circuit board.

11. (Previously presented) The differential diameter hole drilling method of claim 1, in which the first and second laser outputs are generated by one of a UV laser and a CO₂ laser.

12. (Previously presented) The differential diameter hole drilling method of claim 11, in which the UV laser is an Nd:YAG emitting a laser beam having a wavelength of 355 nm.

13. (Original) The differential diameter hole drilling method of claim 1, in which the first and second laser outputs are generated by the same laser.

14. (Original) The differential diameter hole drilling method of claim 1, in which the first and second laser outputs are generated by respective first and second lasers.

Claims 15-18 (Canceled)

19. (New) The differential diameter hole drilling method of claim 1, in which the target material includes silicon.